

Designing Ergonomic Keyboards



CYBOARD

Keyboards that fit like a glove



Erik Trinkle



About Me



Chronic neck and shoulder pain led to interest in ergonomics and ultimately Cyboard's inception

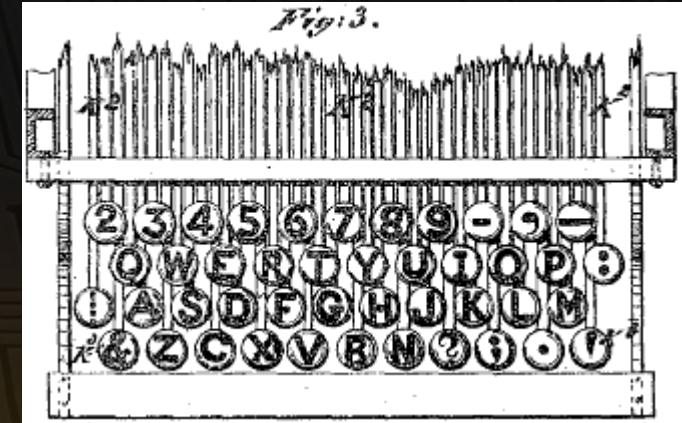


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Traditional Keyboards

- QWERTY – 1878
- Row-stagger for mechanical arms
- Common “Bi-grams” separated to prevent jams



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Traditional Keyboards

Pros	Cons
<ul style="list-style-type: none">• You already know how to use it!• Low-cost	<ul style="list-style-type: none">• Potential for RSI (repetitive strain injury) due to awkward movements• Not optimized for coding• Often non-programmable

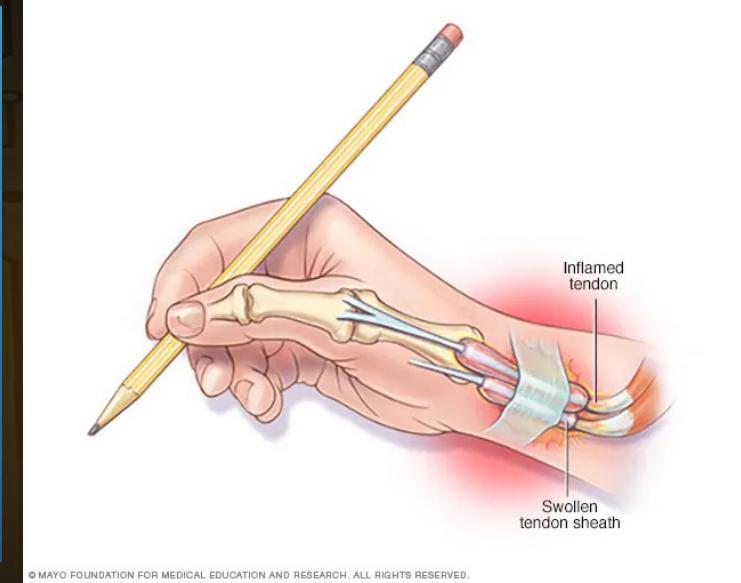


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Computer-related RSI: Hand and Wrist

- Carpal Tunnel Syndrome
- De Quervain Tenosynovitis



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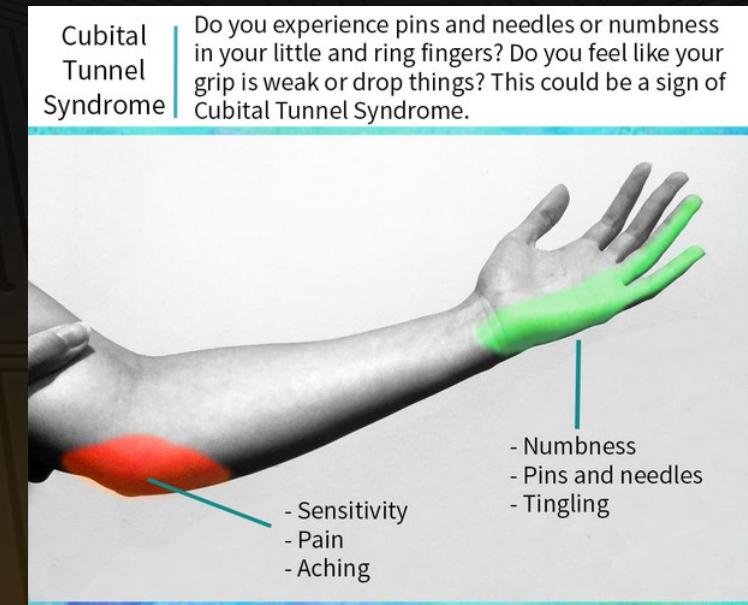
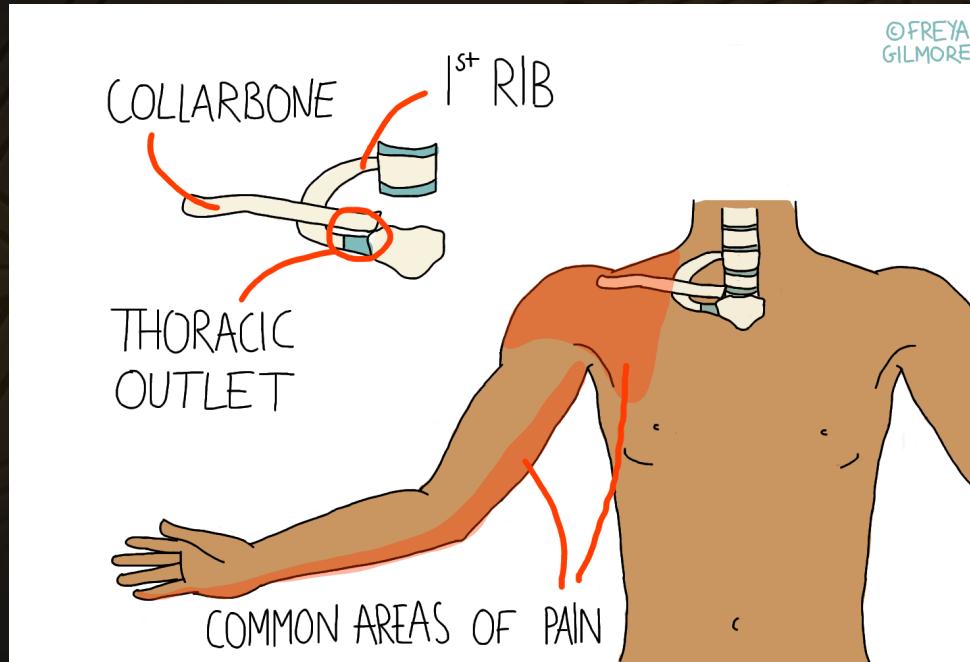


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Computer-related RSI: Arms

- Cubital Tunnel Syndrome
- Thoracic Outlet Syndrome



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Computer-related RSI: Neck

- “nerd neck” forward head posture
- Can lead to nerve impingement in the spine, or general tension, muscle knots, etc.



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Free Preventative Measures

Ergonomic workstation setup



Monitor roughly an arm's length away

Eye level about 2 to 3 inches below the top of the monitor

Head and neck are straight, shoulders relaxed

Elbows at sides and bent at 90 degrees or more

Wrists flat at the keyboard, not angled up

Knees level with your hips or slightly below

Chair with lumbar support, reclined slightly at 100 to 110 degrees

Feet flat on ground or on a footrest



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Ergonomic Keyboard Design

- Remove numpad and navigation cluster to bring mouse closer
- Encourage straight wrists (bent increases strain on carpal tunnel tendons)

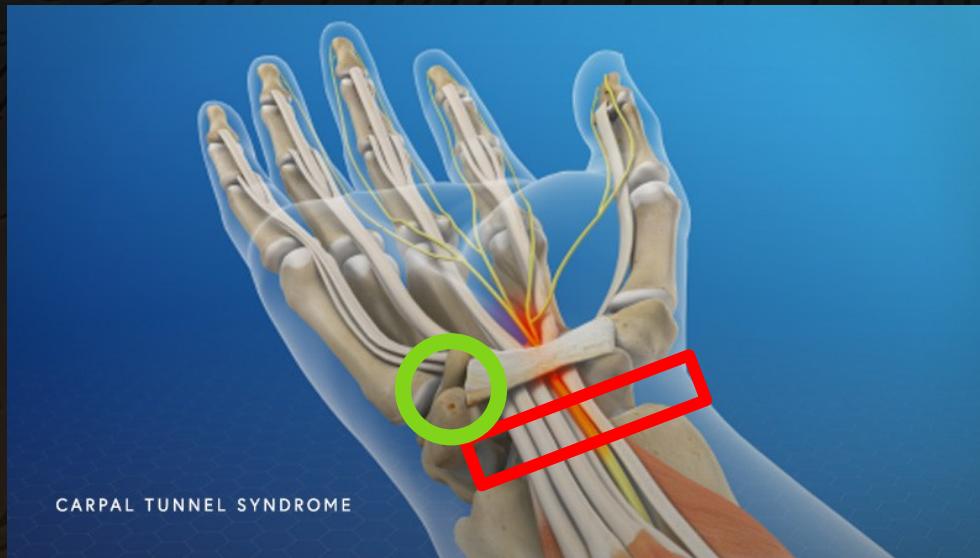


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Ergonomic Keyboard Design

- A note on ~~Wrist~~ Palm Rests



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Ergonomic Keyboard Design

- Split the keyboard in half to avoid:
 - Hunching
 - ulnar deviation

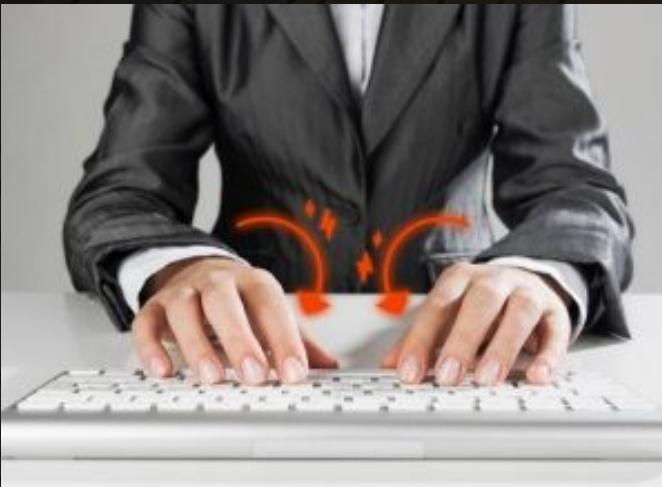


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Ergonomic Keyboard Design

- “tent” to reduce pronation (works for mice, too!)



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Ergonomic Keyboard Design

- Line up the keys in columns, staggered to account for different finger lengths.



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Ergonomic Keyboard Design

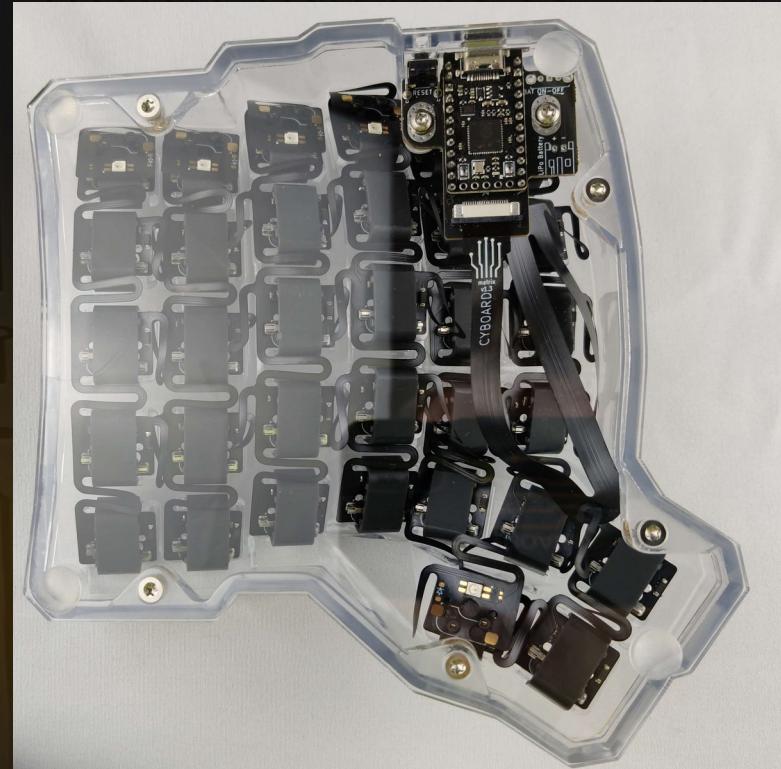
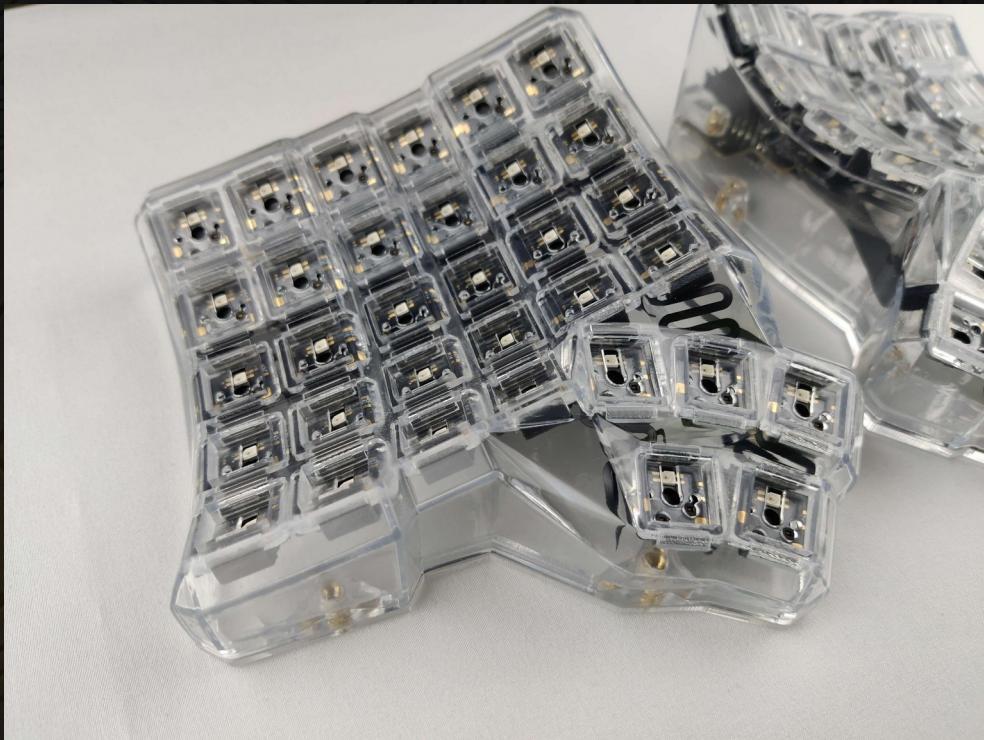
- Curve the keyboard to more comfortably reach more keys
- Dactyl Manuform
 - Current state-of-the-art for DIY ergonomic keyboards, with many variants
 - Time consuming and difficult to build



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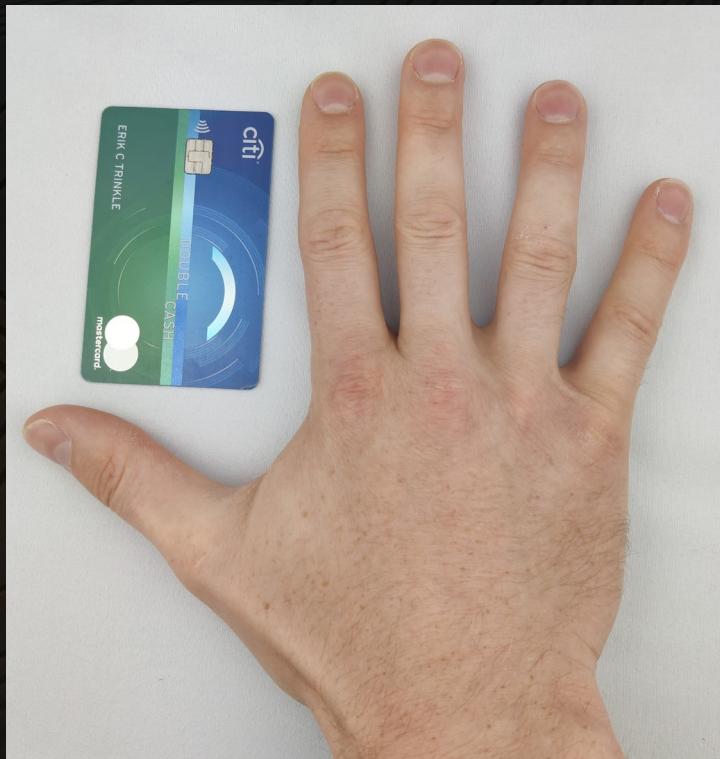
Ergonomic Keyboard Design



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Imprint: a made-to-measure Ergonomic Keyboard



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Imprint: a made-to-measure Ergonomic Keyboard

- No one-size-fits-all board will be optimal for an individual
- Additive manufacturing allows us to build tailored boards at an affordable price.



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Keyboards that fit like a glove

Imprint: a made-to-measure Ergonomic Keyboard

- Improvements over Dactyl Manuform
 - Tailored to your specific hand measurements
 - Non-uniform curvature for each finger (natural spiral instead of circle)
 - Thumb cluster optimized for reach and avoids “pinching” motion that can lead to “texter/gamer’s thumb” RSI.



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Imprint Typing Demo

<https://youtu.be/6SpFyHPpfzs>

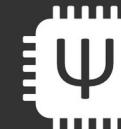
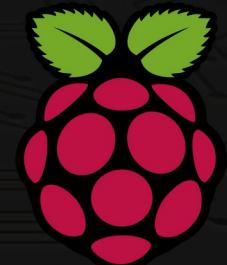


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Modern Keyboards: Hardware and Firmware

- Raspberry Pi RP2040 (Pico)
- QMK Firmware
 - Open Source
 - Allows for many advanced features
- Larger attack surface than older keyboards



Powered by
QMK Firmware



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Re-mapping your Keyboard

- Edit QMK source files and compile locally
- For many tasks, Vial Layout Editor can do this instantly and store the layout onboard.



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Vial

File Keyboard layout Security Theme About

Cyboard Dactyl

Refresh

Keymap Macros Lighting Tap Dance Combos Key Overrides QMK Settings Matrix tester

Layer 0 1 2 3 4 5 6 7 8 9

Esc F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11
+ = ! @ # \$ % ^ & * () _ ~ < > { } [] ; : , . ? / RShift
Tab Q W E R T Y U I O P | H J K L : ; N M < > ? / RShift
LCtrl A S D F G
LShift Z X C V B
Up Down LGui LAlt LGui Enter Del Esc Caps Lock ~ Bksp Space
Home End Caps Lock MO(2)
Basic ISO/JIS Layers Quantum Backlight App, Media and Mouse Tap Dance User Macro

Esc F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 Print Screen Scroll Lock Pause
~ ! @ # \$ % ^ & * () _ + = Bksp Insert Home Page Up Num Lock / * -
Tab Q W E R T Y U I O P { } | Del End Page Down 7 8 9 +
Caps Lock A S D F G H J K L : ; Enter 4 5 6 ,
LShift Z X C V B N M < > ? / RShift Up 1 2 3 =
LCtrl LGui LAlt Space RAlt RGUi Menu RCtrl Left Down Right 0 . Num Enter
Any ▽ ~ ! @ # \$ % ^ & * () _ + { } < > : | ?

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Integrating a mouse

- Track-balls, -points, and -pads can be integrated to avoid reaching for your mouse.



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Resources for Buying/Building Ergonomic Keyboards

- Reddit: [r/ergoMechKeyboards](#)
 - Active community with a very helpful wiki
- [Compare.splitkb.com](#)
 - Print actual-size layouts (for flat boards) to “try before you build”
- [KBD.news](#)
 - Magazine focused on DIY keyboard projects
 - Extensive vendor database
- [Ergogen](#)
 - Tool for building ergonomic PCBs based on desired parameters
- [Cyboard.digital](#) + our Discord



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Thank you!



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use the code “PRELUDE” for \$20 off at Cyboard